

Historic, Archive Document

Do not assume content reflects current scientific knowledge, policies, or practices.

9319.9
R312
Pg. 2
A Summary of Current Program, 7/1/63;
and Preliminary Report of Progress
for 7/1/62 to 6/30/63

CLOTHING AND HOUSING RESEARCH DIVISION
of the
AGRICULTURAL RESEARCH SERVICE
UNITED STATES DEPARTMENT OF AGRICULTURE

This progress report of USDA and cooperative research is primarily a tool for use of scientists and administrators in program coordination, development and evaluation; and for use of advisory committees in program review and development of recommendations for future research programs.

The summaries of progress on USDA and cooperative research include some tentative results that have not been tested sufficiently to justify general release. Such findings, when adequately confirmed, will be released promptly through established channels. Because of this, the report is not intended for publication and should not be referred to in literature citations. Copies are distributed only to members of Department staff, advisory committee members, and others having a special interest in the development of public agricultural research programs.

This report also includes a list of publications reporting results of USDA and cooperative research issued between July 1, 1962 and June 30, 1963. Current agricultural research findings are also published in the monthly USDA publication, Agricultural Research. This progress report was compiled in the Clothing and Housing Research Division, Agricultural Research Service, U. S. Department of Agriculture, Beltsville, Maryland.

UNITED STATES DEPARTMENT OF AGRICULTURE
Washington, D. C.
July 1, 1963

U. S. DEPT. OF AGRICULTURE
NATIONAL AGRICULTURAL LIBRARY

SEP 2 - 1964

C & R-PRG.

TABLE OF CONTENTS

	Page
Introduction.....	i
Area No. 1: Clothing, Household Textiles, and Fabrics for Consumer Use.....	1
Area No. 2: Household Maintenance of Textile Products.....	5
Area No. 3: Rural Family Housing and Household Operations.....	8
Area No. 4: Household Equipment and Nontextile Furnishings.....	13
Line Project Check List.....	18

INTRODUCTION

Clothing and housing constitute the immediate protective environment in which people live and work. From this point of view, clothing and housing directly affect efficiency, comfort, and general well-being, and are of national concern. Expenditures for clothing are estimated at about 10 percent of total personal consumption; for shelter, about 13 percent; and for household operation, housefurnishings, and equipment, about 14 percent. Some 40 percent of family expenditures for apparel and housefurnishings represent cotton, and 37 percent represent wool, according to weights assigned to cotton, wool, and manmade fibers in the Consumer's Price Index of the U. S. Department of Labor. In 1962, 62 percent of all U. S. families owned the houses they occupied.

Clothing and housing research, as used in this report, covers the identification and quantitative evaluation of the needs of rural families and individuals for clothing and housing. Physical, chemical, biological, and psychological factors affecting requirements are investigated, as a basis for developing and applying principles and standards for functional design of apparel, of household equipment and furnishings, and of the interior of the house itself. Attention is given to consumer-use aspects of fabrics made of cotton, wool, and other fibers.

Approximately nine-tenths of the present effort is identified as applied research but, as new projects are undertaken, basic research is emphasized as much as feasible. Cooperative research, conducted on a regional basis, has been a major pattern in housing investigations. Possibilities for use of research contracts and grants are being investigated.

Research findings are disseminated to the scientific public chiefly through technical publications; to teachers, extension workers, and other leaders concerned with helping families and consumers, through semitechnical reports; and to consumers themselves, in popular publications and visual aids. Collaboration with industry, especially in the work of technical committees of such organizations as the American Association of Textile Chemists and Colorists, the American Society for Testing and Materials, and the American Standards Association, provides for consideration of scientific findings and solution of mutual problems, especially with respect to test methods and standards.

The following examples of recent progress illustrate the nature of the program, and the way in which scientific findings are disseminated:

HOUSE PLANNING GUIDES. A new series of aids for planning economical homes that are adapted to the needs of families seeking loans from the Farmers' Home Administration, is in preparation. The first four leaflets have been published, and the fifth is in press. Approximately eight more are scheduled for the near future. Based on results of cooperative research on family housing, each leaflet presents graphically a single subject such as a design of storage areas for clothing, use of corner space in kitchens, and dimensions and arrangements of rooms for the house.

LAUNDERING GUIDES. Procedures for household use of mechanical laundering equipment have been developed on the basis of results of previously reported research by USDA and other organizations on 1) performance of washers, dryers, and hand irons, and 2) on the effects of detergents, brighteners, and other laundering agents on textiles typical of those used by the modern family. These procedures have been incorporated in an overall guide which has been approved for publication. The purpose was to help homemakers use modern equipment and laundering agents for satisfactory removal of soil from clothing and household textiles with minimum shrinkage, change in appearance, and loss of strength.

SANITATION IN HOME-TYPE LAUNDERING. Basic studies related to household hygiene have provided evidence that large numbers of potentially harmful bacteria are frequently present on naturally soiled clothing and household textiles; also, that they survive conditions typical of those used in laundering in the home and in coin-operated facilities. The research has shown that bacteria can be transferred from one article to another during the washing process. The findings indicate that the use of a suitable disinfectant may do much to control the transmission of disease-producing organisms when there is sickness in the home, the school, or the community, or when the sanitation of the laundry equipment is questionable. Interest in the research is being shown by consumers, extension workers, managers of coin-operated laundries, public health workers, and hospital administrators.

BASIS FOR SIZING OF CLOTHING. Body measurement standards for "slim" and "husky" boys were recently developed through cooperation of the large mail-order companies and the U. S. Department of Commerce, with participation by USDA. Similar standards are now being developed for "outsize" girls. Thus, through cooperation between government and industry, continuing use is being made of basic anthropometric data obtained in past research by CH. By giving assurance of good fit without difficult or time-consuming alterations, these research-based standards, like those for "regular-size" boys and girls and the comprehensive body-measurement standard for women previously developed from CH data, should benefit all consumers. They are of special benefit to low-income, rural, and other families who make extensive use of mail-order catalogs in purchasing clothing.

The Clothing and Housing Research Division has its headquarters at the Agricultural Research Center, Beltsville, Md. Its research activities are organized into two Laboratories: 1) Clothing and Textiles, and 2) Housing and Equipment. As shown in the Table of Contents, the work of the Clothing and Textiles Laboratory is reported under Areas 1 and 2, and the work of the Housing and Equipment Laboratory under Areas 3 and 4. The report for each area includes a statement of the problem to be solved, the research program, the progress made during F. Y. 1963, and the publications issued during that period.

AREA NO. 1: CLOTHING, HOUSEHOLD TEXTILES, AND FABRICS
FOR CONSUMER USE

Problem. As a result of the ever increasing variety of clothing, household textiles, and fabrics for home sewing, decision-making by consumers is becoming more and more difficult. The Textile Fiber Products Identification Act which became effective in March 1960 makes mandatory the labeling of textile products as to fiber content, but this only partially solves the problem. To obtain maximum benefit from such labeling, consumers need information on the properties imparted to textiles by cotton, wool, different classes of manmade fibers, fiber blends, fabric constructions and finishes, and on the properties textiles need in order to perform satisfactorily in specific uses.

For guidance in selecting readymade items, and for choosing fabrics and patterns for sewing at home, consumers also need to know what types of construction are suitable for use with various fabrics and for different purposes; and how to alter or repair items when necessary. They also need systems of sizing of patterns and readymade garments which will assure good fit with a minimum of alterations or return of goods. They want garment features that contribute to the comfort, safety, and efficiency of the wearer, and provide other functional characteristics.

USDA PROGRAM

The Department has a continuing research program, involving a cooperative effort of physicists, chemists, biologists, and home economists. They investigate 1) requirements for clothing and household textiles, and 2) interrelationships of such characteristics of fabrics as construction, fiber content, and finish, to their performance in the Laboratory and in use as clothing or household textiles. Changes in appearance and other properties during use are followed subjectively by trained evaluation panels and objectively by the use of appropriate instruments and laboratory procedures. Rapid and dependable methods for predicting performance in use are sought.

Principles of construction for use in making clothing and household textiles from modern fabrics are developed through laboratory investigation. Clothing problems of both normal and handicapped individuals are identified through interviews and observations. Garment features are designed to solve these problems. Anthropometric data are obtained as a basis for the sizing of apparel.

The Federal scientific effort devoted to research in this area totals approximately 6.0 professional man-years, with headquarters at Beltsville, Md.

A. Cotton, Including Blends and Mixtures

1. Knit fabrics. Experimental work designed to provide information on the effect of staple length, mercerization, and blending with nylon on the end-use qualities of filling knit cotton fabrics typical of those used in underwear was completed. Six single yarns (carded Peeler, combed Peeler, combed Pima S-1, and blends of combed Peeler with 10, 20, and 35 percent 420 nylon) and five two-ply yarns (combed Peeler, combed mercerized Peeler, combed Pima S-1, combed mercerized Pima S-1, and combed Karnak) were each made into a plain knit fabric and the corresponding 1 x 1 rib knit fabric. The fabrics were bleached, using a typical commercial procedure, finished to 33 courses per inch, and evaluated in the laboratory. Water absorption was high for all fabrics and did not appear to be related to fiber content. Area shrinkage after restoration on the knit shrinkage gauge was not more than 11 percent for the plain knit, or 14 percent for the rib knit fabrics; the least area shrinkage after restoration (6 percent) was shown by the plain and rib knit fabrics which contained 35 percent nylon. In both plain and rib knit fabrics, resistance to abrasion of the Stoll Universal wear-tester increased with increase in nylon content but the mercerized Pima S-1 fabrics wore as well as the fabrics of the 10 percent nylon blend. In bursting strength, the plain knit fabrics varied from 68 to 81 pounds; the rib knits from 80 to 107 pounds.

To obtain information on performance in use, T-shirts made from the 11 plain knit fabrics were evaluated in the laboratory after being worn (at the Pennhurst School, Spring City, Pa.) and laundered 10, 20, and 30 times. Thirty periods of wear each followed by laundering resulted in a reduction in bursting strength in the underarm area of the T-shirts, varying in magnitude from 24 to 42 pounds. The worn and laundered mercerized Peeler and mercerized Pima S-1 fabrics burst above 60 but below 70 pounds; the carded Peeler, 10 percent nylon blend, and Karnak cotton fabrics burst below 50 but above 40 pounds; the remaining six fabrics were of intermediate bursting strength. The worn and laundered T-shirts showed approximately equal changes in color and whiteness except for those containing 20 and 35 percent nylon. These showed greater changes, with the greatest change being shown by T-shirts containing 35 percent nylon.

The Spring City Knitting Company cooperated in the research by procuring the yarns, knitting the fabrics, and having them bleached and finished; manufacturing the T-shirts, and planning and supervising the wear study. The Clothing and Housing Research Division conducted the laboratory studies and is preparing a report of the research. (CH 1-21)

The increased use of cotton knit fabrics in outerwear, such as dresses, suits, and coats, has resulted in a need for information on factors which affect the elastic behavior of these heavier types of fabrics. To obtain the needed information, research is being initiated on the relationship of such construction factors as yarn size and courses per inch to the elongation and elastic recovery of plain and double knit cotton fabrics typical

of those used in outerwear. Also to be studied is the effect of repeated laundering on these properties. Specifications have been drawn up and a contract awarded for manufacture of the 30 experimental knit fabrics which are to be used in the research. Procedures for evaluating knit fabrics with respect to elastic recovery have been investigated and a report of the findings is being prepared. (CH 1-30)

2. Pile carpeting. Results of an investigation of changes in color and general appearance resulting from soiling and cleaning of cotton pile carpeting dyed to opposite hues of specified values and chromas were discussed in the report for the preceding year. They have now been published as a technical article in the Journal of Home Economics. (CH 1-18, Disc.)

B. Wool, Including Blends and Mixtures

Elastic recovery and dimensional stability in cleaning are the most important properties of wool knit fabrics but little information is available on factors which affect these properties. To obtain such information, a line project is being developed for research on woolknit fabrics comparable to previously reported research on the dimensional stability of cotton knits, and to research now in progress on the elastic behavior of cotton knits. Plans call for including Wurlanized wool knits in the study. Western Utilization which developed the Wurlan treatment for imparting resistance to shrinkage has agreed to cooperate in this phase of the work.

C. Clothing Design in Relation to Functional Requirements and Use

Research on the clothing problems and needs of children, both normal and handicapped, was initiated in F. Y. 1962 but was suspended early in F. Y. 1963 because of the retirement of senior personnel assigned to the work. Present plans call for resumption of the research in September when suitably trained personnel is scheduled to join the staff. (CH 1-24)

D. Principles of Construction of Clothing and Household Textiles

Research on the causes and methods for preventing puckering of seams in "easy-care" cotton fabrics, which was described in the report for the preceding year, is now in abeyance as a result of the retirement of the project leader. (CH 1-23)

E. Information for Consumer Guidance

1. Clothing. The revision of Home Economics Research Report No. 1 "Clothing Fabrics--facts for consumer education" which was discussed in the report for the preceding year has now been accepted for publication by the ARS Information Division. (CH 1-22, Disc.)

Field studies and laboratory work to obtain information needed for revision of the Department's popular-type publications on procedures for repairing clothing and altering patterns were completed. Manuscripts for the revised publications are nearing completion. (CH 1-28)

Exploratory research pertaining to the sizing and serviceability of children's shoes which was discussed in the report for the preceding year is continuing. An annotated bibliography covering the period from 1900 to 1961 on the human foot, with special emphasis on children's feet, is nearing completion. Work has been initiated on a similar bibliography on the serviceability of various shoe components and materials. (CH 1-25)

2. Household textiles. Experimental work leading to the development of procedures for estimating yardage, cutting, making, and hanging draw curtains is nearing completion. Results will be presented in semitechnical form for use by teachers, extension leaders, and others who provide guidance to consumers. (CH 1-26)

PUBLICATIONS REPORTING RESULTS OF USDA AND COOPERATIVE RESEARCH

Cotton, Including Blends and Mixtures

Hensley, M. L. and Ridgely, R. E. 1963. Effect of soiling and cleaning on cotton floor coverings of selected colors. *Journal of Home Economics* 55 (3): pp. 173-183.

Smith, M. 1963. Fitting coats and suits. *Home and Garden Bulletin* No. 11 (Rev.), 24 pp., illus. (Slightly revised)

AREA NO. 2: HOUSEHOLD MAINTENANCE OF TEXTILE PRODUCTS

Problem. The family's supply of clothing and household textile items represents not only a considerable initial investment, but also requires a never-ending expenditure of time and money for maintaining it in good condition. Reliable information on selection and appropriate use of agents such as detergents, bleaches, and fluorescent brighteners for household use is therefore in great demand. To furnish this guidance to consumers, facts not now available must be obtained on the nature of the soils and on environmental and other factors, including microorganisms, which accelerate or inhibit undesirable changes in appearance or other properties of textile materials. As textiles are potential disseminators of pathogenic and odor-producing microorganisms, investigations are needed on methods, suitable for home use, for controlling such transmission, and on the interrelationships of bacteria and fabrics.

USDA PROGRAM

The Department has a continuing program involving chemists, microbiologists, and textile specialists who investigate factors affecting the soiling of fabrics, the redeposition of soil and microorganisms during laundering, and the removal of soils from fabrics. Included are studies on the 1) identity of soils and microorganisms present on used items of clothing and household textiles, and 2) effectiveness of various compounds or formulations in removing soil and microorganisms, maintaining whiteness, and preventing undesirable changes in appearance and other properties. Fabrics differing in construction, fiber content, and finish are used in the work. Families and individuals cooperate in studies of natural soiling and of laundering under actual home conditions.

The research effort, conducted at Beltsville, Md., totals 6.0 professional man-years.

REPORT OF PROGRESS FOR USDA AND COOPERATIVE PROGRAMS

A. Removal of Soil and Prevention of Undesirable Changes in Textiles

Research to determine the causes of the yellowing of white cotton clothing and household textiles which occur during repeated use and laundering has been discussed in previous reports. Results concerned with oily soil as a factor in this yellowing have now been published as a technical article in the American Dyestuff Reporter. Reports on other phases of the research are in preparation. (CH 1-15, Disc.)

As previously reported, research is in progress on the whitening effects produced on fabrics of different fiber types by chemically different types of fluorescent whitening agents when used under conditions simulating home-

type laundering. Experimental work has been completed on the effects of washing repeatedly in solutions of detergent and whitener, or of detergent, whitener, and bleach, followed by rinsing and drying indoors at room temperature on a glass plate. Experiments are in progress in which fabrics are washed in the whitener-containing solutions, rinsed, and dried outdoors in full sunlight. A report giving the results of completed phases of the work was given at the 1962 Agricultural Outlook Conference; a manuscript is being prepared for publication. (CH 1-20)

Studies on bleach usage habits in home laundering, reported at the 1958 Chemical Finishing Conference of the National Cotton Council of America, showed that of women who washed clothes at home, 80 percent used bleach regularly on white clothes, and 30 percent on colored clothes. As a basis for the development of procedures which will enable homemakers to get maximum improvement in fabric appearance with minimum loss of strength, research was initiated on possible interaction of cotton fabric, compounds typical of those found in oily body soil, and hypochlorite bleach under conditions simulating those used in home laundering. (CH 1-29)

B. Transmission of Microorganisms by Textiles and Its Prevention

Redeposition of bacteria as well as of visible soil may occur during home-type laundering, according to findings previously reported from our laboratories. Preliminary results of subsequent investigations indicate that factors which influence this redeposition include fiber type and fabric construction. Other factors, not yet identified, are believed also to be involved. A miniature washing machine was designed and constructed to permit study under controlled conditions of factors affecting this redeposition.

As a follow-up on previously reported research on the use of antimicrobial agents in home-type laundering, disinfectants containing 80 percent pine oil as the active ingredient were evaluated and found to be as effective as the quaternary and phenolic disinfectants discussed in earlier reports. An investigation of "hot" wash water temperatures in a randomly chosen sample of coin-operated washing machines in different areas of two counties provided further evidence of the need for use of suitable antimicrobial agents. "Hot" wash water temperatures varied from 105° to 150° F., averaging 128° F., approximately the same as the national average reported for "hot" wash water in homes. At this temperature large numbers of bacteria were shown, by earlier studies in this Division, to withstand home-type laundering when no antimicrobial agent was used.

A paper which reviews the literature on the transmission of microorganisms by textiles and leather, and points out areas in which further research is needed was prepared at the invitation of the Society for Industrial Microbiology for presentation as part of a symposium at their August meeting. (CH 1-27)

Results of previously reported research on the identity of bacteria which survived home-type laundering of naturally soiled clothing and household textiles have now been published in a technical paper in Volume IV of Developments in Industrial Microbiology. Dissemination of these and other research findings has continued through such media as TV and radio interviews, feature articles in home magazines and trade organs, and talks to groups of teachers, homemakers, editors of farm journals, and others. A manuscript for a Home and Garden Bulletin on Sanitation in Home Laundering is in preparation. (CH 1-19, Disc.)

PUBLICATIONS REPORTING RESULTS OF USDA AND COOPERATIVE RESEARCH

Removal of Soil and Prevention of Undesirable Changes in Textiles

McLendon, V. and Richardson, F. 1963. Residual oily soil as a factor in yellowing of used and laundered white cotton articles. American Dyestuff Reporter 52 (4): pp. 112-118.

Transmission of Bacteria by Textiles and Its Prevention

McNeil, E. and Choper, E. A. 1962. Disinfectants in home laundering. Soap and Chemical Specialties 38 (8): pp. 51-54, 94, 97-100.

McNeil, E. and Choper, E. A. 1963. Disinfectants in Home Laundering. (Abridged version of the preceding paper of same title.) Hospital Bureau Research News. Supplement to Volume 10, No. 5, 10 pp.

McNeil, E. 1963. Studies on bacteria isolated from home laundering. Developments in Industrial Microbiology 4.

McNeil, E., Chairman, AATCC Research Committee RA-31, 1962. Antibacterial Agents---Annual Report of Committee. AATCC Technical Manual 38, p. A33.

McNeil, E., Chairman, AATCC Antibacterial Agents Committee. Progress Reports presented at meetings of the Technical Committee on Research. American Dyestuff Reporter 51 (24): P. 939 (209th Meeting) 1962; 52 (9): P. 340-341 (210th Meeting) 1963.

AREA NO. 3: RURAL FAMILY HOUSING AND HOUSEHOLD OPERATIONS

Problem. Much present-day farm housing is obsolete and in need of replacement or major repairs. Technological advances of many kinds are affecting the kind of work and leisure time activities carried on in rural homes which consequently create changes in housing needs. For designing and remodeling houses for families at different income levels, architects, designers, lending agencies, and others helping rural families, need research-based standards for work and storage spaces. They are asking also for guides for efficient arrangement of house interiors. As a basis for the design of houses that meet modern family requirements, information is needed concerning the type and scope of household activities, patterns of use of water, electricity, and gas; dimensions and arrangements of space required for work and for use and storage of equipment and house-furnishings; comparative human energy costs involved in using housing facilities of different designs; and the advantages and disadvantages of various types of interior finishes. Improved procedures for performing housework are needed to maximize return from input of human skills and material resources.

USDA PROGRAM

The Department has a continuing program involving home economists, physicists, and architects. To identify housing problems and determine relative urgency from the national standpoint of various phases of applied research, field studies of housing requirements of the rural population or particular segments of it are conducted from time to time in regions differing in geographic or climatic conditions. As needed, pilot studies are conducted to establish research procedures and to provide appropriate instrumentation for investigations in the field or in the laboratory. The human energy costs of performing household tasks using housing facilities and mechanical equipment of different designs are determined and data are obtained on space requirements for family activities and storage of possessions. Criteria for efficient arrangements of kitchens and other areas of the house are thus established as a basis for development of standards, planning guides, and house plans. These are prepared to meet the needs of 1) families, 2) lending agencies (particularly the Farmers' Home Administration), and 3) architects, designers, builders, and others who assist families with planning problems. Basic data are published in professional journals and USDA bulletins for use by scientific colleagues, teachers, and other leaders. Semitechnical guides are also made available for use as teaching aids in the Extension Service, the Rural Areas Development Program, and other public and private programs.

Most of the research is conducted at headquarters in Beltsville, Md., in close cooperation with the Agricultural Engineering Research Division, and for special investigations from time to time, in cooperation with State Experiment Stations. The Federal scientific effort devoted to research in this area is approximately 7 professional man-years.

REPORT OF PROGRESS FOR USDA AND COOPERATIVE PROGRAMS

A. Family Requirements for Space, Water, Light, and Other Needs

1. Practices in use of water by farm households. A pilot study to determine the kind and scope of farm household activities related to water use was done in five counties near Beltsville, Md., during June, July, August, and September 1962. Information was obtained by interviewing full-time homemakers in 200 farm-operator households consisting of two or more members and living in houses equipped with hot and cold running water and a power washing machine.

In this area of generally abundant rainfall and adequate ground water of good quality, few respondent-homemakers had complaints about the household water supply (one or more wells, generally), water pressure in the house, or the sewage disposal system. Only one-fourth of the homemakers interviewed during June and July when wells in the area were full reported that they made any special effort to conserve water; during the dry months of August and September, the percentage increased to 50 percent. Repairing leaking faucets immediately and not letting water run unnecessarily were the two methods of conservation most frequently reported.

The usual pattern for plumbing fixtures in the house was one each of kitchen sink, bathtub, lavatory, and water closet. Separate electric water heaters with capacity between 50 and 59 gallons were found more frequently than other type or size. About half of the washing machines were the automatic type which were found most frequently in homes where there were children under 12 years of age and in household of four or more members.

Frequency of laundering varied with type of machine owned; over half of the owners of nonautomatic washers concentrated their laundering activities into a single day; only 3 percent of the automatic owners did so. Over half of the owners of automatic machines use them five, six, or seven days a week; only 2 percent of the nonautomatic users wash that frequently. Some relationship was found between family type and the prevalence of soaking clothes before laundering and washing by hand.

Water-using activities concerned with meal preparation and clean up were less automated than laundering. Only one in eight of these 200 families owned a dishwasher and one in 30 had a food waste disposer. Owners of automatic dishwashers washed some articles by hand one or more times a day. They rinsed dishes under running water before washing them; most homemakers

without dishwashers did not. The practices of preparing, fast cooling, or thawing foods under running water were common.

A preliminary report of findings, with special emphasis on laundering practices, was presented at the annual meeting of the Housing and Equipment Section, American Home Economics Association, in June 1963. (CH 2-16)

2. Water consumption on farmsteads. Constant records of water use for periods of one to three weeks duration, and for different seasons of the year, were obtained on five dairy farms located in the same counties as the respondents on the study of water-using practices reported in A-1. Quantities of hot and cold water used for household purposes and duration of waterflow in kitchen, bath, and laundry areas of the farmhouse were measured during the first year of metering, and data are being analyzed.

New farms are being added as metering records for four seasons are completed on the originally selected farmsteads. This study is cooperative with the Agricultural Engineering Research Division, which is securing quantitative data on water use for farming operations. (CH 2-16)

B. Interior Designs, Planning Guides, and Plans

A leaflet describing a third energy-saving kitchen design, developed experimentally to incorporate results of previously reported research on human energy expenditures and space requirements for household activities, was published in February 1963. Preparation of the technical report on experimental aspects of the work on kitchen designs remains suspended, pending release of staff time from other assignments. (CH 2-14)

Findings of regional research applicable to the design of housing for low- and medium-income rural families are being compiled, and translated into a simple, largely pictorial form for presentation in a planned series of approximately 35 single-topic leaflets. Thirteen of the leaflets will be prepared by CH, 14 by AE, and the remainder by the two Divisions jointly. The first four leaflets prepared by CH relate to different kitchen arrangements--L-shaped, U-shaped, broken-U, and parallel-wall. They were published in June 1963. A fifth leaflet on corner storage in kitchens is in press. Several leaflets relating to other areas of the house are in preparation.
(CH 2-18)

Basic data resulting from Southern regional research on space requirements for living and sleeping areas are being compiled and classified. Content and format have been planned for graphic presentation as Part II of Planning Guides for Southern Rural Homes. A member of the CH staff is chairman of the regional committee responsible for preparation of the bulletin.
(CH 2-11, Rev.)

"Planning the Bathroom," one of the earliest and most popular bulletins in the "Your Farmhouse" series (published 1948-1952) of house planning aids, is being revised to incorporate findings of regional research on space requirements and finishing materials, and up-to-date information on plumbing fixtures, accessories, and materials. Publication of the revised manuscript, prepared in cooperation with ARS Information Division, is scheduled for the latter half of F. Y. 1964. (CH 2-11, Rev.)

Emphasis in the Department's program on development of house plans that meet the needs of rural families was placed on development of designs of 1400 square feet or less to meet the requirements of the Farmers' Home Administration. In cooperation with AE, a design for a 3-bedroom house, based on an Arkansas plan and developed primarily for the Southern Region but usable in all regions, was completed. A modified version of a recently completed plan based on a Utah design was prepared in which the footage on the main floor was reduced from 1560 to 1386 square feet. In spite of this reduction in total area, layouts for activity and storage areas meet the minimum standards developed through research. Incorporation of research-based standards into other plans was started. One was a plan submitted by Florida containing less than 1400 square feet; the other, a plan submitted by North Carolina that will meet the pressing need of FHA clients for a design containing about 1000 square feet. (CH 2-9, Rev.)

A report of consultation and advisory services on planning apartments for the elderly, given to the National Capital Housing Authority in 1961-1962, has been submitted for publication in the ARS series, in a form suitable for distribution to other organizations engaged in planning living units suitable for elderly occupants.

C. Household Operations

The determination of the physiological energy costs of household activities serves as a basis for design of housing facilities and for development of working procedures that conserve energy. In examining laboratory data collected over a period of years, it was observed that with repetition, the Calories needed to perform certain tasks decreased. A special analysis was made of the energy expenditure data for 21 activities to appraise possible "learning" effects.

It was found that energy expenditures for sitting and standing quietly, and for 8 of 21 activities, showed no significant decrease with a repetition of trials, presumably because the work conditions were already familiar to the subjects, all of whom were experienced homemakers. For 13 of the activities, significant decreases in energy expenditure resulted with increasing number of times the task was performed. Negative linear relationships indicated learning. Rates of decrease appeared to vary according to the type of basic component movements involved in each task, e.g. manipulatory as compared with travel components. Data from studies of 7 of the 13 tasks were also fitted by quadratic curves, an indication

of interrupted learning effects at the place where the task became more difficult. A report of these results on women subjects is to be given at the Sixth International Congress of Nutrition, in Edinburgh, Scotland, on August 12.

Further study of the physiological aspects of energy expenditure in relation to complex body movements is needed as a basis for better understanding of factors affecting work efficiency and the nature of fatigue.

Laboratory determinations are now underway of the human energy costs of using tank, canister, and upright vacuum cleaners. (CH 2-4, Rev.)

PUBLICATIONS REPORTING RESULTS OF USDA AND COOPERATIVE RESEARCH

Interior Designs, Standards, and Planning Guides

Anonymous. 1962. 3-bedroom farmhouse...slab-on-grade, frame construction. Plan No. 7150. USDA Misc. Pub. No. 912, 2 pp., illus. (CH and AE cooperating.)

_____. 1962. 3-bedroom farmhouse...masonry, slab-on-grade. Plan No. 7141. USDA Misc. Pub. No. 914, 2 pp., illus. (CH and AE cooperating.)

_____. 1962. 1-bedroom farmhouse...slab-on-grade, frame construction. Plan No. 7154. USDA Misc. Pub. No. 915, 2 pp., illus. (CH and AE cooperating.)

_____. 1962. 2-bedroom farmhouse...masonry construction. Plan No. 7155. USDA Misc. Pub. No. 916, 2 pp., illus. (CH and AE cooperating.)

_____. 1962. 3-bedroom farmhouse...masonry, with basement. Plan No. 7139. USDA Misc. Pub. No. 917, 2 pp., illus. (CH and AE cooperating.)

Howard, M., Tayloe, G., and Parker, R. 1963. Beltsville energy-saving kitchen, Design No. 3. USDA Leaflet No. 518, 8 pp., illus.

_____. 1963. House Planning Aid: U-shaped kitchen arrangements. USDA Misc. Pub. No. 933, 4 pp., illus.

_____. 1963. House Planning Aid: Broken-U kitchen arrangements. USDA Misc. Pub. No. 934, 4 pp., illus.

_____. 1963. House Planning Aid: L-shaped kitchen arrangements. USDA Misc. Pub. No. 935, 4 pp., illus.

_____. 1963. House Planning Aid: Parallel-wall kitchen arrangements. USDA Misc. Pub. No. 936, 4 pp., illus.

AREA NO. 4: HOUSEHOLD EQUIPMENT AND NONTEXTILE FURNISHINGS

Problem. Homemakers are asking for information on the selection, use, and care of different designs of household equipment, and of different types of furniture and other nontextile furnishings. To obtain the information needed for such guidance, the development of test procedures and determination of performance requirements are essential. These procedures and performance requirements are also needed for incorporation in Federal Specifications which are used for government purchases of household-type items, and in American Standards which are widely used by testing agencies and manufacturers who desire to put better adapted products on the market and label them so that consumers will know the performance that can be expected. Information on operating characteristics of various designs of equipment for cooking, refrigeration, laundering, cleaning, and other household tasks are needed as a basis for development of semitechnical materials urgently requested by Extension Service personnel, teachers, and others working with farm families.

USDA PROGRAM

The Department has a continuing program of research on household equipment and nontextile furnishings which involves home economists and physicists. The performance characteristics of different designs of equipment under conditions representative of household use are determined as a basis for unbiased information for consumers in selecting from models of ranges, refrigerators, washers, vacuum cleaners, and other equipment available on the market, the design and special features that meet their particular needs. Research is also conducted to determine performance requirements for household equipment as a basis for advice to manufacturers in improvement of designs for food-related and textile-related equipment, and for items used in cleaning interior surfaces in the home. Test procedures for these determinations are developed as necessary.

The research is carried on at Beltsville, Md., and involves approximately 5.0 professional man-years. Cooperation of microbiologists and chemists of the Clothing and Textiles Laboratory staff is given as needed. Manufacturers cooperate in this work by giving consultation in the selection of equipment and development of test procedures in many instances, and by consigning household equipment for use in laboratory investigations.

REPORT OF PROGRESS FOR USDA AND COOPERATIVE PROGRAMS

A. Functional Requirements and Specifications

1. Hand iron soleplate temperatures. Ironing temperatures that will produce smoothness with minimal damage to fabrics have been determined. Fabrics (without special finishes) of natural and manmade fibers were used.

An oral report of findings was presented at the annual meeting of the Housing and Equipment Section, American Home Economics Association, in June 1963, and a technical report is being prepared.

Temperatures as low as 275° resulted in visible damage to modacrylic fabrics when pressed for 5 seconds. In contrast, silk and cotton showed no visible damage at temperatures of 425° for 5 seconds. However, repeated ironing of silk at this temperature resulted in decreased tearing strength. The temperatures that caused least damage to blended fabrics were those safe for the most sensitive fiber in the blend.

Results indicate that hand iron soleplate temperatures should be controllable within the range of 225° and 425° for ironing modern day fabrics without special finishes. Additional research is needed on fabrics with easy-care and other functional finishes. (CH 2-15)

2. Development of specifications. A meeting of the American Standards Association Sectional Committee C70, chaired by CH staff, was held in December to resolve differences between manufacturers and utility representatives on the maximum permissible value of current leakage. Some progress was made in reaching agreement on this question, which affects the completion of standards for electrically heated bed coverings, steam and dry hand irons, and waffle bakers and sandwich grills.

Other consultations and correspondence were conducted to resolve basic differences of opinion among representatives on various committees, among them ASA B38.1, concerned with a revision of the method of computing food storage volume and shelf area of automatic refrigerators, and the Federal Specifications Committee on Domestic Electric Ranges.

CH staff served on the Z61.1 subcommittee for revising the recently adopted ASA Standard--Dimensions, Tolerances, and Terminology for Home Cooking and Baking Utensils. (CH 2-6, Rev.)

B. Operating Characteristics, Use, Maintenance, and Care of Equipment

1. Automatic portable cooking appliances. An exploratory study of the operating characteristics and cooking performance of five portable appliances as compared to similar cooking processes performed with electric ranges, has been completed and a technical report published. A paper, "Some Considerations in Buying Portable Cooking Appliances," was presented at the 1962 Agricultural Outlook Conference.

Two samples, each of different manufacture, of 3- and 5-quart automatic saucepans, fry pans, roaster ovens, and rotisserie ovens were used for comparisons with two standard electric ranges of different manufacture in tests of eight different cooking processes: braising, boiling, deep fat frying, pan frying, simmering, stewing, broiling, and baking.

Results showed that in general the portable appliances gave products that were as acceptable as those cooked by the ranges. The thermostats of the automatic utensils were calibrated to permit selection of required cooking temperatures. The capacity of the portable ovens was adequate for baking the five test foods. The range ovens, however, with balanced heat input from the lower and upper heating elements and a larger capacity for air circulation, gave more even top and bottom browning. The design of the heating element in range and portable oven broilers influenced evenness of heat distribution more than the type of appliance.

The portable appliances required more time than ranges for cooking food individually and as meals. The additional time was used to bring food up to cooking temperature or to preheat the ovens to the temperature needed. The slightly longer time required by the portable appliances presented no difficulties in actual preparation of meals. Cleaning the automatic utensils required 31 percent more time than cleaning their nonautomatic counterparts but, when cleaning the cooking counter and range top was included, the total time for cleaning up was the same.

The ranges used more electric energy than the portable appliances for cooking foods individually and as meals. For individual foods, the percent increase in kilowatt hour consumption of ranges over the automatic utensils amounted to 24 percent; for baking, 18 percent; and for broiling, 77 percent. For the two meals, ranges used 34 percent more electric energy than the set of appliances.

The inherent design of the automatic utensils influenced the ease of using them. The built-in heating element, removable heat control, and supporting legs made them heavier and more awkward to handle than the nonautomatic counterpart. Heat controls located beneath the handles were out of the way when pouring from the utensils but were difficult to see. It was more difficult to insert and remove food from roaster-ovens than from the range and rotisserie-ovens, and more time was required.

This exploratory study indicates that a "set" of portable appliances, including a 3-quart saucepan, 5-quart saucepot, fry pan, and a portable oven, can substitute satisfactorily for an electric range, if a sufficient number of convenience outlets of adequate circuit requirements is available, and the homemaker has the ability to modify management practices. (CH 2-13, Disc.)

2. Performance of mechanical home dishwashers. Electric and gas dishwashers are being studied in respect to their ability to remove food residues and microorganisms from tableware. The original 14 machines used as "tools" for the research were selected by a joint Laboratory-Industry committee to typify the various design features available to consumers. The models used included impeller and hydraulic arm washing actions; top and front loading; under-counter and portable installations. They represented bottom-, middle-, and top-of-line models. Results of the investigation can serve as a basis for development of performance standards for dishwashers.

Initial work has as its objective the development of realistic test procedures for evaluating performance of dishwashers. It includes selection of test soils for evaluating performance; effect of storage method and lag between time of soiling and washing test dishes; and methods for visual evaluation of cleanness. Two papers reporting work to date on development and evaluation of test soil are in preparation.

Laboratory work on the bacteriological evaluation of two dishwashers, an impeller and a hydraulic arm type, has been completed. Emphasis has been on: comparison of bacterial retention on three types of dishes (earthenware, plastic, and china); possible correlation between the amount of food soil and bacteria remaining on dishes; antibacterial effect of length of wash cycle, maximum wash temperature, and maximum drying temperatures, as well as other operational differences between machines. A manuscript "The Use of a Plastic Mold for the Enumeration of Bacteria on Cups" has been cleared for publication. (CH 2-17)

3. Refrigerators and refrigerator-freezers. Results of previously reported research on operating characteristics and performance of frozen-food storage compartments in refrigerators and refrigerator-freezers were published in the November 1962 issue of the Journal of the American Society of Heating, Refrigerating, and Airconditioning Engineering. (CH 2-12, Disc.)

PUBLICATIONS REPORTING RESULTS OF USDA AND COOPERATIVE RESEARCH

Operating Characteristics, Use, Maintenance, and Care of Equipment

- McCracken, E. C and Churchill, F. 1962. Frozen-food storage in household refrigerators. ASHRAE Journal 4 (11): pp. 27-34.
- Tayloe, G. 1962. Some considerations in buying portable cooking appliances. Unnumbered. 7 pp. (Processed.) (Paper presented at 40th Annual Agricultural Outlook Conference, Washington, D. C.)
- Churchill, F. and Thye, L. S. 1963. Performance characteristics of portable electric cooking appliances. Journal of Home Economics 55 (4): pp. 261-267.
- Anonymous. 1963. Automatic cooking appliances substitute for a range. Family Economics Review, ARS 62-5, p. 15.
- Taube, R. Katherine. 1963. How hot should your hand iron be? (Processed by AHEA.) (Paper presented at Annual Meeting of Housing and Household Equipment Section, American Home Economics Association, Kansas City, Missouri.)

Line Project Check List -- Reporting Year July 1, 1962 to June 30, 1963

Work & Line Project Number	Work and Line Project Titles	Work Locations During Past Year	Line Proj. Incl. in	
			Summary of Progress	Area & Sub- Subheading
CH 1	Fabric quality, construction, and care of clothing and household textile articles.			
CH 1-15	Yellowing of cotton fabrics.***	Beltsville, Md.	Yes	2-A
CH 1-18	Effect of soiling and cleaning on the appearance and properties of vat and direct dyed cotton pile floor coverings with and without soil retardant finishes.***	Beltsville, Md.	Yes	1-A-2
CH 1-19	Evaluation of antimicrobial agents for use in home laundering.***	Beltsville, Md.	Yes	2-B
CH 1-20	Improvement of fabric color with fluorescent whiteners.	Beltsville, Md.	Yes	2-A
CH 1-21	End-use qualities in knitted fabrics as affected by staple length, by mercerization, and by blending of medium staple cotton with nylon.	Beltsville, Md. Spring City, Pa.	Yes	1-A-1
CH 1-22	Revision of Home Economics Research Report No. 1, "Clothing Fabrics--facts for consumer education."**	Beltsville, Md.	Yes	1-E-1
CH 1-23	Principles of clothing construction on modern cotton fabrics.	Beltsville, Md.	Yes	1-D
CH 1-24	Clothing to meet the requirements of children.	Beltsville, Md.	Yes	1-C
CH 1-25	Bibliography of research pertaining to children's shoes.	Beltsville, Md.	Yes	1-E-1
CH 1-26	Draw Curtains--Development of procedures for estimating yardage, cutting, making, and hanging.	Beltsville, Md.	Yes	1-E-2
CH 1-27	Redeposition of bacteria on fabrics during laundering.*	Beltsville, Md.	Yes	2-B
CH 1-28	Clothing Repair--A revision of Farmers' Bulletin No. 1925, "ABC's of Mending."*	Beltsville, Md.	Yes	1-E-1
CH 1-29	Use of hypochlorite bleach on soiled cotton fabrics as a factor in deterioration of cotton fabrics.*	Beltsville, Md.	Yes	2-A
CH 1-30	Elastic recovery of cotton fabrics of plain and double knit constructions.*	Beltsville, Md.	Yes	1-A-1
CH 2	Functional requirements, use, and care of the home and its equipment.			
CH 2-4 (Rev.)	Human energy expenditures for household activities.	Beltsville, Md.	Yes	3-C
CH 2-6 (Rev.)	Preparation of specifications for household equipment.	Beltsville, Md.	Yes	4-A
CH 2-9 (Rev.)	Participation in the development of farmhouse plans for Regional Exchange Services.	Beltsville, Md.	Yes	3-B
CH 2-11 (Rev.)	House planning guides for rural homes.	Beltsville, Md.	Yes	3-B
CH 2-12	Time-temperature patterns of frozen-food compartments of household refrigerators.***	Beltsville, Md.	Yes	4-B
CH 2-13	Space requirements and performance characteristics of separate automatic cooking appliances.**	Beltsville, Md.	Yes	4-B
CH 2-14	Planning guides for energy-saving kitchens and workrooms.	Beltsville, Md.	Yes	3-B
CH 2-15	Hand iron temperatures for present-day fabrics.	Beltsville, Md.	Yes	4-A
CH 2-16	Farm household water use: A pilot study.	Beltsville, Md.	Yes	3-A
CH 2-17	Performance of mechanical dishwashers for the home.	Beltsville, Md.	Yes	4-B
CH 2-18	Guides for planning activity and storage areas in housing for low- and medium-income families.	Beltsville, Md.	Yes	3-B

* Initiated during reporting year.

** Discontinued during reporting year.

*** Discontinued prior to reporting year.